

Quality Control Plan **And** **Quality System Manual**



Haviland Drainage Products Co.
Haviland, Ohio

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Haviland Drainage Products Co.

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**Eastern States Consortium (ESC)
For HDPE Pipe Manufactures
Participating States 2004**

Connecticut	New Jersey
Delaware	New York
District of Columbia	North Carolina
Maine	Pennsylvania
Maryland	Rhode Island
Massachusetts	Vermont
New Hampshire	Virginia



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Quality Mission Statement

(As Posted)

Haviland Drainage Products is committed to providing customers with the highest quality of drainage products, complying with all required regulations and specifications. We strive for continual improvement in our processes, materials, delivery, and professional relationships with our customers.

- Craig Stoller, President DPI

Quality System Manual

The purpose of this manual is to give direction to laboratory technicians on procedures for the testing of plastic products based on the quality standards set by Drainage Products, Inc. This manual also encompasses the testing standards of the current AASHTO M-252, AASHTO M-294 specifications and ESC requirements.

Facility Layout and Production Process

All HDPE plastic products are manufactured at our location in Haviland, OH. Haviland Drainage Products will allow all state DOT inspectors or their agents to enter the manufacturing plant or testing facility, unannounced, to observe the manufacturing process, review quality control testing, testing records, obtain samples for testing, inspect testing facility, product storage & transport. For reasons of safety all visitors must report to the office and be accompanied by a HDP representative.

Five parts combine to create the plant layout: raw material storage, extruders, corrugators, auxiliary equipment, and packaging equipment.



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An extruder is located at the beginning of each production line. Raw material is fed from a material hopper located on the throat of the extruder and into a screw. The screw moves the material from one end of the extruder to the other, melting it in the process. Melted plastic is continuously extruded into a corrugator.

The corrugator is located a few feet from the end of the extruder. Once the plastic reaches the corrugator it is molded into pipe. The corrugator consists of mold blocks that travel continuously in a circular pattern pulling the formed pipe. Plastic is forced against the block walls by vacuum or air pressure to give it its shape. As it moves through the blocks, it is cooled to retain its form.

From the corrugator the plastic moves into the auxiliary equipment if required. If the pipe is to be perforated it is then ran through a perforator to be slotted or drilled. All pipe is then packaged into the appropriate sized coils or bundles.

The finished pipe is then taken to staging areas. While in this staging area the Quality Control Department will perform spot audits of the finished product. Any suspect product found at this time is tagged and not allowed to be placed into the finished goods areas until released by the Quality Control Manager or his designate.

The finished pipe is moved from the staging area to the yard and placed into storage or loaded directly onto trucks depending on customer requirements and HDP inventory levels.



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Quality Control Plan

The parameters that Haviland Drainage Products Co. uses for quality control are based on the specifications of AASHTO M-252 and AASHTO M-294. Copies of the AASHTO specifications, QSM, company test procedures, latest ESC review and corrective actions are kept available to all quality control personnel.

Each shipment of raw material has a lot number from the supplier and is used for traceability at Haviland Drainage Products, and must be accompanied by a certification from the raw material supplier verifying that the materials provided meet the applicable AASHTO standards. Reworked / reprocessed plastic may be used if it was from M252 or M294 pipe and meets melt & density requirements.

Product samples are pulled by Quality Control and conditioned as per required frequency. Once the samples are conditioned, testing is performed as is required by the current AASHTO specifications, or customer specific specifications, relating to that product, and the Quality System Manual. Test results are recorded on the Test Report by the Laboratory Technician and forwarded to the Quality Manager if an issue exists. In the event that the Laboratory Technician is absent for any reason, the Quality Control Manager is responsible for assigning someone to perform the appropriate testing for the day. When products meet quality specifications they are added to designated AASHTO product inventories. If products do not meet the correct specifications, those products are removed from AASHTO specification inventories and products with corresponding lot numbers are evaluated for compliance to the applicable specifications. Test Reports are retained for 5 years, and can be made available to specifying agencies upon request. Annual independent third party test results can also be made available upon request.

Finished products falling under AASHTO Designation: M252 are stamped at least every ten feet with the manufacturer's name, the M252 specification number, the product size and pipe lot number. The



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pipe lot number is a four to six digit number that includes a Julian date for the day of the year the production run was started, a Julian year, the building number that the product was produced in, and the number of the production line on which the product was manufactured. The term lot in reference to the pipe consist of all the same size product that is produced from the beginning of a production run to the end of a production run. If a production run is longer than one week a new lot number will be assigned starting at 12:01 am Monday morning. Date mold inserts may also be used in place of the Julian system in the 8" & 10" pipe, changed everyday at 12:01am. and this is the pipe lot number.

Finished products falling under the AASHTO Designation: M294 are stamped three times per twenty foot sticks with the manufacturers name, product size, the M294 Specification number, the product size and the day, month and year. The date on the mold date inserts is changed everyday at 12:01am. and this is the pipe lot number.

Upon customer request, test reports can be made available for specific projects and will be filed with the corresponding shipping information.

All Dual Wall pipe has integrated bell & spigot design and thus uses the same material. All certified Dual Wall fittings are also made from cut sections of certified pipe.



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AASHTO M252 and M294 Products

RAW MATERIAL TESTING

HDPE resin intended to be used for AASHTO M252 and M294 products must be accompanied by a Certificate of Analysis from the resin manufacturer providing verification that the resin meets the requirements of the current AASHTO M252 and M294 specifications. Resin will be pre-certified to meet the requirements of M294 through PPI listing or testing by an approved third party prior to use for ESC certified pipe or fittings. Shipment is defined as a rail car compartment or hopper truck load or 40 gaylord box quantities. In the case of a rail car quantity melt and density tests are conducted for each compartment. If resin fails testing it will not be used to produce products for any ESC state. A random sample will be taken from each lot and tested for melt index and minimum density. Reworked / reprocessed plastic may be used if it was from M252 or M294 pipe and meets melt and density requirements.

PRODUCT TESTING

When samples are pulled from production for testing purposes, the samples should be identified with the date the samples are obtained. This date then becomes the Sample ID. This Sample ID should then be transferred to a Test Report for that product.

Testing to be performed for each of the following items and all results should be recorded.

1. Condition all samples per AASHTO M252 or M294 based on applicable standard.
2. Weight - Verify weight per foot of sample with company product standards. (In several cases the section of pipe must be longer than 12" due to corrugation size.) Minimum of two times per shift.
3. Melt Flow Index in accordance with ASTM D-3350. Minimum of one time per day.
4. Density in accordance with ASTM D-3350. Minimum of one time per day.



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5. Workmanship – A visual inspection should be performed according to AASHTO M252 and M294, a minimum of one time per day.
6. Measure Inner Wall Thickness per AASHTO M252 and M294, Minimum of two times per shift with one time being done with micrometers.
7. Inside Diameter per AASHTO M252 and M294, Minimum of once per shift.
8. Length of the pipe per AASHTO M252 and M294, Minimum of one time per shift.
9. Perforations and water inlet area inspected per AASHTO M252 and M-294, Minimum of once per shift.
10. Pipe Stiffness per AASHTO M252 and M294, Minimum of two times per week.
11. Pipe Flattening per AASHTO M252 and M294, Minimum of two times per week.
12. Environmental Stress Crack Resistance per AASHTO M252 and M-294, Minimum of once per year.
13. Brittleness per AASHTO M252 and M294, Minimum of two times per week.
14. Joint Integrity per AASHTO M252 and M294, Minimum of once per quarter.
15. Markings and marking spacing, according to AASHTO M252 and M294. Check at beginning of production run.
16. Carbon black content, once per day
17. Elongation per AASHTO M252. Minimum of once per production year.
18. Low Temperature Flexibility per AASHTO M252. Minimum of once per production year.
19. Pipe fittings and couplings will be tested for fit and function at a minimum of three times per shift.



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EXCEPTIONS TO AASHTO M252 and M294

Humidity Not Controlled In Laboratory

Controlling humidity in the laboratory, though mentioned in AASHTO M252 and M294, is not a standard practice in the HDPE corrugated pipe industry. Haviland has conducted the following testing experiment to support our practice of not controlling laboratory humidity.

1. A sample of Haviland Smooth-Flow pipe was conditioned in a temperature controlled environment completely immersed in water for a period of 24 hours. Upon immediate removal from the water, all of the tests required in AASHTO M252 and M294 were performed on the pipe sample.
2. A separate sample from the same piece of pipe was conditioned in the same temperature controlled environment, except that it was not immersed in water. All of the tests required in AASHTO M252 and M294 were performed on the pipe sample.
3. The two separate tests produced the same results, supporting the belief that a humidity controlled environment has no bearing on the tests required by AASHTO M252 and M294.

Length of Pipe Not Measured in Controlled Laboratory Environment

For several reasons, Haviland does not make it a practice to measure the pipe for the required length in a controlled laboratory environment. The following reasons support this practice.

- A sample of Haviland Smooth-Flow pipe was measured to determine the length of the sample in a temperature controlled environment, according to the AASHTO M252 and M294 standard. The same pipe sample was then conditioned in outdoor temperatures exceeding 85 ° F. and again measured for correct length. In addition, this pipe sample was then conditioned in a freezer set to 25 ° F. and again measured. Each time the sample was measured, there were no significant measurable differences in the length of the pipe sample.



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- Haviland supplies pipe in standard lay lengths of 13 feet and 20 feet. The laboratory used at Haviland is not of sufficient size to accommodate a full piece of pipe; therefore the length of the pipe cannot be measured in the laboratory.

STATISTICAL ANALYSIS

Statistical analysis for pipe weight is used to help to improve the production process and reduce the possibility of crush testing failure. Daily staging area audits are performed and the results are generated graphically to show trends to help in the continual improvement process. Other statistical analysis will be considered if determined that it will help to improve our process, provide a more consistent product and lower manufacturing costs.

NON-CONFORMING PRODUCTS

Testing Failure

At any point during testing, if a product is found to be non-conforming to the applicable specifications, the following steps must take place.

1. These non-conforming products should then be removed from inventory and disposition determined.
2. Testing failure results are given to the shift supervisors and operators for proper adjustment.
3. After adjustments are made the products are then retested until products pass all applicable tests.

Non-Conforming Product Inspection

At any point during the production process a product is found to be non-conforming to the applicable specifications, the following steps must take place.

1. Operator must remove non-conforming product from production and put pipe into grinder for reprocessing.
2. Operator must check previously ran product back to a point that the non-conformance did not exist.



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3. If the suspect product can not be inspected on line it must be identified and removed from the production area and the production foreman notified to be inspected at a later time.

Non-Conforming / Damaged Product

1. If non-conforming product is found in the staging area, or the yard, it must be identified and separated from the finished product storage.
2. Product will be repaired if possible and reinspected / tested and returned to finished products storage.
3. If product can not be repaired it will be moved to the grind area.

Returned material

1. If material is returned from a customer, the Returned Material Report must be completed and forwarded to Quality Manager for investigation.
2. Product will be inspected / tested and repaired, if possible; and returned to the yard.
3. If product can not be repaired it will be moved to the grind area.
4. The Quality Manager will attempt to contact the customer to determine the extent of the non-conformance and take the necessary corrective action.
5. Any inventory with the same date code will be inspected for the same condition, repaired, tested, or removed from the yard.
6. In many cases the Quality Manager will post a Quality Alert notification in the building that produced the non-conforming product.
7. A root cause will be sought and corrective action taken.
8. Returned material will not be used for sale to an ESC state.



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Laboratory Capabilities

All physical testing on finished pipe products is performed at our laboratory in Haviland, Ohio. Melt Index and Density tests can also be performed at this laboratory. Any additional raw material tests are performed at one of the three following private laboratories.

1. ARDL Plastics Testing
2887 Gilchrist Road
Akron, OH 44305

2. TRI / Environmental
9063 Bee Caves Road
Austin, TX 78733



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LABORATORY EQUIPMENT

The following is a list of equipment used in our lab in Haviland, Ohio.

<u>Manufacturer</u>	<u>Equipment</u>	<u>Model</u>
Kayeness	Melt Flow Indexer	7049
Dynisco	Melt Flow Indexer	D 1001
Techne	Density Column	TE 8J
Ohaus	Electronic Scale	SC 2020
Lo-Tes	Parallel Plate Deflection Tester	
Carver	Press	C
Testing Machine Inc.	Izod Impact Tester	43-01
Testing Machine Inc.	Notching Cutter	22-05
Drainage Products, Inc.	Brittleness Tester	M-252
Drainage Products, Inc.	Brittleness Tester	M-294
Drainage Products, Inc.	ESCR Tank	
ThermoKing	Box Truck Freezer	MDII

Calipers, Micrometers and various measuring equipment.

Equipment shall be calibrated at a minimum of once per each 12 months.

Calibration and maintenance records are retained and available for review.

Any needed equipment maintenance will be documented and kept on file for reference.



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Quality Department Personnel

Quality Control Manager – Greg Schafer

a) Supervisor – General Manager

b) Job Description / Duties:

- Oversees inspection of all finished products.
- Oversees inspection of all blow molded products.
- Supervisor of Laboratory Technician, and Quality Technician.
- Purchaser of F477 gaskets and pipe wrap.
- Assists in production planning and inventory control.
- Customer contact for quality issues.
- Other duties as assigned.

c) Experience:

- 1986 – 2005 Operations & Engineering Manager, Young Spring & Wire
- 2005 – present Quality Control Manager, Haviland Drainage Products

d) Education:

- Associates degree in Civil / Architectural Engineering, Owens Community College
- Bachelor of Science in Civil / Environmental Eng., Bowling Green State Univ.



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Laboratory Technician – Jeff Hunter

a) Supervisor – Quality Control Manager

b) Job Description / Duties

- Ongoing testing of raw materials.
- Maintains quality testing records.
- Calibrates lab equipment and schedules outside calibration service.
- On going testing of finished products.
- Other duties as assigned.

c) Experience:

- 1996 – present Laboratory Technician, Haviland Drainage Products

d) Education:

- Bachelor of Science in Comprehensive Science, Cedarville College

Quality Technician – Randy Letso

e) Supervisor – Quality Control Manager

f) Job Description / Duties

- Assists testing of raw materials.
- Finished product inspections.
- Blow molded product inspection.
- Assists on testing of finished products.
- Other duties as assigned.

g) Experience:

- 2005 – present Quality Technician, Haviland Drainage Products



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Material Manager – Denny Osting

h) Supervisor – General Manager

i) Job Description / Duties

- Assists in the testing of raw materials.
- Supervises raw material handlers.
- Maintains raw materials records.
- Purchases all raw materials and sock materials.
- Other duties as assigned.

j) Experience:

- 1981 – 1990 Construction Crew Supervisor
- 1991 – present Materials Manager, Haviland Drainage Products

k) Education:

- Associates Degree in Business Mgmt and Marketing, Northwestern Business College

Technician Training and Competency Reviews

- Technicians are mentored by individuals familiar with the operation of the laboratory equipment and applicable quality standards.
 1. Denny Osting began this procedure in 1996 with the hiring of Jeff Hunter.
 2. Jeff Hunter is currently mentoring Randy Letso in correct testing procedures.



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- Competency reviews are done annually and include all applicable testing procedures. These are also observed by the Quality Manager during various third party audits.

Quality Audits

- Currently Haviland Drainage Products has on site annual audits by the Plastic Pipe Institute, Inc (PPI) as well as tri-annual reviews of pipe testing by the City of Columbus. Several other states and providences have various forms of quality reviews which Haviland complies with. The results of these audits are discussed with the company President and corrective actions taken as needed.
- Annual submission to the ESC. An ESC representative will select (2) pipe sizes of pipe. Each sample will be a split sample, one sample will be sent to an independent lab and Haviland Drainage Products will perform comparative testing. Testing of pipe and results furnished to the ESC.



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Applicable AASHTO M-294 Products

12" Smooth Flow Pipe	Type S & SP
15" Smooth Flow Pipe	Type S & SP
18" Smooth Flow Pipe	Type S & SP
24" Smooth Flow Pipe	Type S & SP
30" Smooth Flow Pipe	Type S & SP
36" Smooth Flow Pipe	Type S & SP
42" Smooth Flow Pipe	Type S & SP
48" Smooth Flow Pipe	Type S & SP
12" Corrugated Pipe	Type C & CP
15" Corrugated Pipe	Type C & CP
18" Corrugated Pipe	Type C & CP
24" Corrugated Pipe	Type C & CP

Applicable AASHTO M-252 Products

4" Smooth Flow Pipe	Type S & SP
6" Smooth Flow Pipe	Type S & SP
8" Smooth Flow Pipe	Type S & SP
10" Smooth Flow Pipe	Type S & SP
4" Corrugated Pipe	Type C & CP
6" Corrugated Pipe	Type C & CP
8" Corrugated Pipe	Type C & CP
10" Corrugated Pipe	Type C & CP



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Approved Raw Materials

Supplier

Innovene LLC

(formerly BP Solvay Polyethylene North America)

Total Petrochemicals USA, Inc.

(formerly Atofina)

HDPE Resin

CP52-35

K54-05

G50-100

CD-522

The above sources have been previous suppliers, others may be added if they are on the PPI approved resin supplier list.

Lab Testing Summary Addendum

<u>Size</u>	<u>Type</u>	<u>Date</u>	<u>Laboratory</u>	<u>Results</u>
4"	S & SP	3/21/05	Internal Lab	Passed
6"	S & SP	2/11/2004	TTL	Passed
8"	S & SP	2/11/2004	TTL	Passed
10"	S & SP	2/11/2004	TTL	Passed
12"	S & SP	6/6/2006	TRI / Environ.	Passed
15"	S & SP	2/11/2004	TTL	Passed
18"	S & SP	2/11/2004	TTL	Passed
24"	S & SP	2/11/2004	TTL	Passed
30"	S & SP	2/11/2004	TTL	Passed
36"	S & SP	7/18/2003	TRI / Environ.	Passed
42"	S & SP	7/18/2003	TRI / Environ.	Passed
48"	S & SP	6/6/2006	TRI / Environ.	Passed
4"	C & CP	12/5/2005	Internal Lab	Passed
6"	C & CP	12/5/2005	Internal Lab	Passed
8"	C & CP	12/9/2005	Internal Lab	Passed
10"	C & CP	1/12/2006	Internal Lab	Passed
12"	C & CP	7/18/2003	TRI / Environ.	Passed
15"	C & CP	7/18/2003	TRI / Environ.	Passed
18"	C & CP	7/18/2003	TRI / Environ.	Passed
24"	C & CP	7/18/2003	TRI / Environ.	Passed